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A Systematic Review of Neighborhood Disparities in Point-of-Sale Tobacco Marketing

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Abstract

Objective—Tobacco industry documents show systematic targeting by race, ethnicity, and income at the point of sale (POS). We sought to systematically review evidence of disparities in tobacco marketing at tobacco retailers by socio-demographic neighborhood characteristics.

Methods—We identified 43 relevant papers from 893 results of a systematic search in 10 databases updated on May 28, 2014. We found 148 associations of marketing (price, placement, promotion, or product availability) with a neighborhood demographic of interest (socioeconomic disadvantage, race, ethnicity, and urbanicity). We conducted a narrative review and present results stratified by neighborhood characteristics and types of tobacco product marketing.

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Contributors

K. M. Ribisl and L. Henriksen originated the study. J. G. L. Lee conducted the analysis and drafted the manuscript. J. G. L. Lee and S. W. Rose coded articles. All authors provided critical feedback on the study design, edited the manuscript, and approved the final version.

Human Participant Protection

No human participant protection was required because no human participants were involved in this study.

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Results—There are disparities in the marketing of tobacco products by neighborhood demographics. Socioeconomic disadvantage is associated with more tobacco marketing. Disparities in menthol marketing are starkly present, with targeting toward more urban neighborhoods and neighborhoods with more black residents. Smokeless tobacco products are targeted toward more rural neighborhoods and neighborhoods with more white residents. Differences in store type partially explain these disparities.

Conclusion—Geodemographic market targeting, a standard marketing practice across industries, represents an issue of social and environmental injustice for youth exposure to tobacco marketing and for smokers whose quit attempts may be stymied by disproportionate marketing in lower-income neighborhoods and neighborhoods with more black residents.

Keywords

tobacco industry; smoking; reproducibility of results; environments; health status disparities; marketing

INTRODUCTION

Tobacco products and their marketing materials are ubiquitous in U.S. retailers from pharmacies to corner stores.(1) Similar presence is found across the globe, except in countries that ban point-of-sale (POS) tobacco marketing (e.g., Australia, Canada, Thailand(2)). In the U.S., the POS has become the main communications channel for tobacco marketing(3, 4) and is reported as a source of exposure to tobacco marketing by over 75% of U.S. youth.(5) Burgeoning evidence(6, 7) suggests that marketing at the POS is associated with youth brand preference,(8) smoking initiation,(9) impulse purchases,(10, 11) and compromised quit attempts.(12, 13)

The marketing of tobacco products is not uniform; it is clear from industry documents that the tobacco industry has calibrated its marketing to target specific demographic groups defined by race,(14) ethnicity,(15) income,(16) mental health status,(17) gender,(18, 19) and sexual orientation.(20) Framed as an issue of social and environmental justice,(14) research has documented historical racial, ethnic, and socioeconomic disparities in the presence of tobacco billboards,(21-25) racial disparities in total tobacco marketing volume,(24) and targeting of menthol cigarettes to communities with more black residents.(25, 26) Targeted marketing of a consumer product that kills up to half(27) its users when used as directed exacerbates inequities in morbidity and mortality. Indeed, smoking is estimated to be responsible for close to half of the difference in mortality between men in the lowest and highest socioeconomic groups.(28) However, evidence of marketing disparities is scattered across multiple disciplines and marketing outcomes, such as product availability, advertising quantity, presence of promotional discounts, and price. Synthesis of this literature would provide valuable information for intervention on tobacco marketing in the retail environment and inform etiologic research on health disparities.

To address this gap in the literature, we aimed to systematically review observational studies that examined the presence/quantity of POS tobacco marketing to determine the extent to

which marketing disparities exist by neighborhood demographic characteristic (i.e., socioeconomic disadvantage, race, ethnicity, and urbanicity).

METHODS

Peer-Reviewed Literature Search

We followed the PRISMA systematic review guidelines for observational studies(29) by iteratively developing a series of keywords in four domains (1) tobacco, (2) marketing, (3) disparity, and (4) retail environment. Using PubMed, we added controlled vocabulary terms (i.e., MeSH terms) to our search. Once our search resulted in no new relevant papers, we translated our controlled vocabulary terms into the controlled vocabulary of other databases (online-only appendix A).[1] Thus, each database was searched using the indexing terms indigenous to that database as well as our standard keywords. We implemented our search on July 18-19, 2013, and updated it on May 28, 2014, in 10 databases: Academic Source Complete, Business Source Complete, Cumulative Index to Nursing and Allied Health Literature, Communications and Mass Media Complete, and PsycINFO via EBSCO; Embase; GEOBASE; ISI Web of Knowledge; PubMed; and, Scopus. We used no date, language, or geographic restrictions in our search.

Inclusion Coding of Records

We sought to identify records[2] where disparities in tobacco marketing were assessed through observational data collection at retail locations. We defined *disparities* to include differences in tobacco marketing by income or other measures of socio-economic disadvantage, by race (Asian, African-American/black), by ethnicity (Hispanic/Latino), and by urbanicity. We defined *marketing* to include price (e.g., advertised price, price discounts or price promotions), promotion (e.g., branded advertisements and displays), placement (e.g., at child height, location near register), and product characteristics (e.g., unit size, single cigarettes, flavor) (i.e., the four P's of marketing).(30) Marketing could be indoors or outdoors as long as it was assessed at a retail location (e.g., shop, street vendor, snack bar, pharmacy). However, we *a priori* determined that records reporting solely the availability of cigarettes were not included. *Tobacco products* included cigarettes, cigars, little cigars, snus,

[1]PubMed search: ((tobacco products[MeSH] OR tobacco[tiab] OR tobacco industry[MeSH] OR (smoking[MeSH] NOT marijuana smoking[MeSH]) OR smoking[tiab] OR cigarette[tiab] OR cigarettes[tiab] OR cigar[tiab] OR cigars[tiab] OR cigarillo[tiab] OR cigarillos[tiab]) **AND** (marketing[MeSH] OR marketing[tiab] OR advertising[tiab] OR advert[tiab] OR adverts[tiab] OR promotion[tiab] OR promotions[tiab] OR ads[tiab] OR commerce[MeSH] OR price[tiab] OR placement[tiab] OR positioning[tiab] OR product[tiab] OR signs[tiab] OR signboard[tiab] OR signboards[tiab] OR discounts[tiab] OR "functional items"[tiab] OR signage[tiab] OR display[tiab] OR displays[tiab] OR "single cigarette"[tiab] OR "single cigarettes"[tiab] OR loosies[tiab]) **AND** (socioeconomic factors[MeSH] OR disparity[tiab] OR disparities[tiab] OR health status disparities[MeSH] OR inequality[tiab] OR inequalities[tiab] OR equity[tiab] OR inequity[tiab] OR inequities[tiab] OR targeting[tiab] OR target[tiab] OR targets[tiab] OR neighbourhood[tiab] OR neighbourhoods[tiab] OR neighborhood[tiab] OR neighborhoods[tiab] OR residence characteristics[MeSH] OR "residence characteristics"[tiab] OR contrasting[tiab] OR community[tiab] OR communities[tiab] OR (black[tiab] NOT "black market"[tiab]) OR "african american"[tiab] OR latino[tiab] OR latina[tiab] OR latinos[tiab] OR hispanic[tiab] OR hispanics[tiab] OR asia[tiab] OR asian[tiab]) **AND** (store[tiab] OR stores[tiab] OR "point of sale"[tiab] OR "points of sale"[tiab] OR retail[tiab] OR retailers[tiab] OR retailer[tiab] OR retailing[tiab] OR shop[tiab] OR "gas station"[tiab] OR "gas stations"[tiab] OR "point of purchase"[tiab] OR "points of purchase"[tiab] OR outlet[tiab] OR outlets[tiab] OR "milk bars"[tiab] OR newsstands[tiab] OR kiosk[tiab] OR petrol[tiab] OR garage[tiab] OR garages[tiab] OR "service station"[tiab] OR "service stations"[tiab] OR pharmacy[tiab] OR pharmacies[tiab] OR druggist[tiab] OR druggists[tiab] OR supermarket[tiab] OR supermarkets[tiab] OR grocers[tiab] OR groceries[tiab] OR hypermarket[tiab] OR hypermarkets[tiab] OR vendor[tiab] OR vendors[tiab] OR vending[tiab]))

[2]We use the terminology of "record" to indicate a published paper identified in our search. "Study" indicates a research project from which multiple published papers may have been published. "Results" are the reported findings contained with published records.

smokeless tobacco, e-cigarettes, and other products derived from tobacco. Two coders (JGLL, SWR, and two graduate research assistants) independently reviewed titles and abstracts of records identified in the search for inclusion or exclusion. Differences were reconciled by discussion.

Data Abstraction

Following an abstraction protocol, each included study's characteristics were independently abstracted by two coders (JGLL and SWR or a graduate research assistant). Data were entered into online survey software and then merged by JGLL into an evidence table. Where bivariate associations could not be computed from the published data, we requested a correlation matrix from the corresponding author for studies published in the last ten years. Results were coded so that a positive sign indicated the presence of a hypothesized disparity.

Inclusion of Results

We included results in a two-step process shown in Figure 1: (1) a narrative synthesis and (2) assessment of statistical tests.

Narrative synthesis

All records reporting any findings, including qualitative, that involved visiting tobacco retailers and that assessed neighborhood disparities in tobacco marketing were included in the evidence table for narrative review.

Assessment of statistical tests

For each record, we identified all results with a statistical test of association between the neighborhood characteristics of socioeconomic disadvantage, race, ethnicity, or urbanicity and any measure of marketing. In this stage, we excluded results for the following reasons: (1) where effect sizes were for change over time; (2) for area units at the county level or larger, as these are subject to the modifiable area unit problem(31); (3) analyses reported for “other” race due to category heterogeneity; (4) in the case of single cigarette sales, we excluded measures based solely(32, 33) on retailer advertising of sales (e.g., “loosies - 35¢”) because advertisement of an illegal practice may not be a valid measure(34); and, (5) where there is limited or insufficient evidence to hypothesize marketing toward more vulnerable populations. E-cigarettes,(35) potentially-reduced exposure products, and premium cigars may be targeted to less vulnerable populations and would thus attenuate evidence of targeting more disadvantaged and more diverse communities.

After these exclusions, results were graphed to depict the distribution of direction of associations.

Analysis

We stratified all analyses by neighborhood demographics: socioeconomic disadvantage, race (African American/black, Asian), ethnicity (Hispanic/Latino), “minority” status,[3] and urbanicity. Results specific to menthol marketing, smokeless marketing, and little cigar/cigarillo marketing were also stratified, as differences between groups targeted could

attenuate the relationship. Data management was conducted in SPSS 22 (IBM, Chicago, Illinois). Meta-analysis of common measures was not possible due to the limited number of available effect sizes with common measures of neighborhood characteristics and outcomes. The evidence table reports bivariate associations of marketing with neighborhood characteristics. Where both bivariate and adjusted results were reported, we chose to emphasize bivariate relations because a diversity of model covariates limited the comparability of adjusted results.

Systematic reviewers are challenged by how to weight the evidence based on studies' risk of bias in narrative reviews.(36) To identify the strongest, most generalizable evidence for emphasis in the narrative review, we created an index of study characteristics, giving one point for (a) having >10 neighborhoods;[4] (b) having >100 retailers; (c) addressing spatial dependence; (d) using probability-based sampling of neighborhoods; and, (e) using probability-based sampling of retailers. One study scored zero. Eight scored one, and eight scored two. Five scored three. The remaining 21 scored four to five. The index was correlated with the year of publication, $r_{s(n=43)}=0.45$, $p<0.01$, suggesting improvements in studies over time. While all studies are reported in the evidence table, we focused our narrative description on results from the 21 studies with an index value of four or five.

RESULTS

Study Characteristics

There were 43 records from eight countries that met the inclusion criteria: 33 from the U.S.,(32, 33, 37-67) five from Australia,(68-72) and one each from Canada,(73) Guatemala and Argentina,(74) India,(75) New Zealand,(76) and the United Kingdom.(77) The first study was published in 1989,(40) and through 2013 (the last full year of data) there was a significant increase in publications per year, $r_{s(n=17)}=0.72$, $p<0.01$. From these, we identified 284 study results of which 148 included information on significance and direction of association. An evidence table is available online (Appendix B). Below we first discuss the general pattern of results.

Common Outcome Measures—Among the 43 records, 28 reported on promotions including measures of the presence of any tobacco marketing on the exterior of stores, an index of tobacco marketing materials, and counts of marketing per square mile. Seventeen reported on price, including the presence of price discounts, advertised prices, and purchase prices. Sixteen reported on product characteristics, including single cigarettes and types of smokeless tobacco. Twelve reported on placement of marketing, including prominent display of tobacco ads at the POS and products near candy. Seven additionally reported on compliance with marketing regulations.(32, 33, 37, 50, 51, 72, 76) More detail is presented in the accompanying evidence table.

[3]Minority status is the terminology used by the original authors, often indicating non-white, non-Hispanic status or being left undefined.

[4]For the studies not reporting the number of area units used, we gave a point if the number of retailers audited would average over 10 per area unit at the 10-area-unit cutoff (i.e., >100 / 10 = >10).

Level of Analysis and Sample Size—Most studies analyzed results at the store level; however, one study analyzed some outcomes at the advertisement level (i.e., each ad was a case in the analysis, which looked at differences in advertisement characteristics by neighborhood)(59) and four studies analyzed outcomes at the neighborhood level, deriving mean values,(40) aggregating marketing up to marketing per square mile,(60) calculating individual brands' share of all ads,(57) and providing total counts of ads in neighborhoods(38)). Of the 32 studies that reported the number of area units (i.e., neighborhoods as defined by the study) excluding one study using store-centered buffers, (39) the average was 89 (sd=134, median=36, range: 2-624). Of the 39 studies that reported the number of retailer audits conducted, the average was 425 (sd=671, median=240, range: 23 to 3989).

Area Units—Although census tracts (or equivalents) were the most common choice (n=13 studies), many other area units were used to describe neighborhood demographics, including school neighborhoods (variously defined) (n=6), census block groups or equivalent (n=5), or postal codes (n=3). Sixteen studies used other approaches, including business districts,(38, 53) buffering around observed retailers and averaging census block group characteristics, (39) using a one mile radius from a youth-serving organization,(44) combining postcodes based on informant knowledge,(33) and creating spatial units that were unique to the study. (62)

Statistical Approaches—Neighboring tobacco retailers may share similarities (i.e., spatial autocorrelation may be present), causing the collected data to violate assumptions of independence in standard statistical tests.(31) Indeed, of the 5 papers(54-56, 64, 65) that reported intra-class correlations (ICCs) for measures of marketing, the ICCs ranged from 0.025 for retailers' number of smokeless tobacco ads in census block groups in a Midwestern U.S. city(64) to 0.36 for the proportion of menthol marketing at retailers in census tracts in St. Louis, MO, U.S.(56) Eight studies addressed this issue by using mixed models, usually multi-level models or generalized estimating equations.(41, 43, 46, 54-56, 62, 73) Another four studies corrected for dependence using robust standard errors.(32, 64, 65, 68) One paper aggregated marketing to the census tract (index value per square mile) and found no significant spatial autocorrelation as indicated by Moran's *I* and Geary's *c*.(60) However, the majority of research (70%) did not comment on the issue of spatial auto-correlation.

Twelve records sampled retailers so as to have maximally contrasting groups. Four records compared extremes within their analysis. While we note that sampling designed to produce more extreme comparisons can inform etiologic research, these strategies limit generalizability across neighborhoods. Fifty-eight percent of records dichotomized or otherwise categorized (e.g., median/mean split, tertiles or quintiles) demographic correlates and marketing outcomes that were originally continuous measures. Such categorization can reduce power to detect an effect.(78)

Evidence of Disparities in POS Tobacco Marketing—We turn here from the characteristics of included records to the evidence presented in them. We first discuss disparities in tobacco marketing by neighborhood socioeconomic disadvantage followed by

race, ethnicity, and urbanicity. Figure 2 shows the count of results that showed a negative association, no association, or a positive association between neighborhood characteristics and POS marketing, for tobacco products generally (including studies that are specific to cigarettes only), menthol-specific marketing, smokeless-specific marketing, and little cigars/cigarillos-specific marketing. The top left cell shows that a major area of research focus has been on socioeconomic disadvantage as well as indicating that a preponderance of evidence finds a positive association between socioeconomic disadvantage and POS tobacco marketing. In contrast, the bottom left cell shows that we found no evidence of overall POS tobacco marketing disparities by urbanicity excluding menthol-, smokeless-, and cigar-specific marketing. Looking at the first column, there are very few negative associations between the neighborhood characteristics and POS tobacco marketing. In menthol column, we identified only evidence of a positive association between greater numbers of black neighborhood residents and POS menthol marketing.

While exploratory research has clearly documented differences in tobacco marketing between very different neighborhoods in single cities,(38, 53, 57, 59, 66, 67, 75) we focus our narrative on larger studies using probability sampling that address spatial dependence (i.e., those scoring four or five on our five-point index of study characteristics).

Evidence of Disparities by Socioeconomic Disadvantage—Of the 43 records, 29 examined differences in marketing by neighborhood income or any other indicator of socioeconomic disadvantage.(32, 33, 37-39, 42-44, 46, 48, 52-54, 57, 59, 60, 63-65, 68-77) Of these, 12 scored high in our study-characteristic index.(32, 33, 39, 46, 48, 55, 60, 64, 65, 68, 73, 76) Across these studies, there was a clear pattern of targeted marketing in more disadvantaged neighborhoods. Menthol marketing also shows evidence of disproportionate presence in more socioeconomically disadvantaged neighborhoods while we identified no evidence of disparities in smokeless or little cigars.

Seven studies showed greater marketing in areas of more socioeconomic disadvantage. In New South Wales, Australia, higher postcode quartile of socioeconomic disadvantage was associated with lower cigarette prices.(68) In a study of 20 Canadian cities, results from mixed modeling found that median household income was inversely related to an index of marketing after controlling for city, neighborhood, and retailer characteristics; the unadjusted association was marginally significant.(73) In Ramsey and Dakota County, Minnesota, greater census block group socioeconomic disadvantage was associated with more menthol and exterior advertisements but not other indicators of marketing such as total advertisements.(65) In 14 neighborhoods in Columbus, Ohio, placement of products and total number of ads were not significantly different between high and low socioeconomic deprivation neighborhoods; however, there were more exterior ads on average in neighborhoods with more socioeconomic disadvantage than those with less disadvantage.(33) In Oklahoma County, Oklahoma, lower quartiles of income and education were associated with greater tobacco marketing.(48) In Omaha, Nebraska, lower tract median income was associated with more logged marketing materials per square mile after control for percent male, number of small stores, and outlet density; the unadjusted association was also positive.[5](60)

Some results did not show disparities by socioeconomic disadvantage. In a study of New York City pharmacies,(39) neighborhood educational attainment was not associated with marketing, but neighborhoods above median income were more likely to advertise cigarettes than below median income. The authors attributed this difference to greater presence of chain pharmacies in richer neighborhoods; chain pharmacies were more likely to advertise tobacco products than independent pharmacies.(39) In the Wellington area of New Zealand, stores' presence in the lowest four compared to the highest three deciles of neighborhood socioeconomic disadvantage was not associated with the placement of tobacco products near children's products nor visibility of tobacco products from the outside of the store (both of which are banned).(76)

Regarding specific characteristics of marketing, no relationship was found between socioeconomic disadvantage and the presence of cigars, little cigars, and cigarillos at the block-group level in 50 California cities.(55) In Ramsey and Dakota County, Minnesota, greater census block group socioeconomic disadvantage was associated with smokeless marketing using measures of census block group proportion of residents on public assistance but not with residents under the poverty line.(64) In 14 neighborhoods in Columbus, Ohio, counts of smokeless advertisements were not significantly different between high and low socioeconomic deprivation neighborhoods.(33) In three North Carolina counties, greater proportion of families living under the poverty line was associated with likelihood of the presence of a violation of U.S. Food & Drug Administration tobacco advertising and labeling regulations, controlling for county, store type, and other census-tract characteristics.(32) In 91 California school neighborhoods, the percentage of students participating in the School Lunch Program was associated with a smaller proportion of menthol advertising at retailers after control for store type, school demographics, and school neighborhood characteristics.(46)

Evidence of Disparities by Black Race in U.S.—Of the 33 studies from the U.S., 19 reported on black race.(32, 39, 41, 44, 46, 47, 49-51, 53, 55-57, 60, 63-67) Of these, 10 scored high on our study characteristics index.(32, 39, 41, 46, 49, 55, 56, 60, 64, 65) Evidence suggested disproportionate POS marketing neighborhoods with more black residents. Evidence of greater menthol marketing is unequivocal and there is evidence of disproportionate presence of little cigar and cigarillos marketing. Smokeless tobacco marketing may be targeted to neighborhoods with fewer black residents.

It is of note that the majority of the evidence scoring high in our study characteristics index addresses menthol marketing but not overall marketing for neighborhoods with more black residents. Indeed, only one record reporting a significant association of overall marketing scored high in our study characteristics index: In Ramsey and Dakota County, Minnesota, across a number of different marketing outcomes, there was a general pattern of greater tobacco marketing at retailers in census block groups with more black residents.(65)

There are unequivocal disparities in menthol marketing; the evidence consistently showed greater menthol marketing in more neighborhoods with more black residents. In St. Louis,

[5]Personal e-mail communication from Mohammad Siahpush on April 21, 2014.

Missouri, using mixed models, census tract percent black and the percent of black children were significantly associated with measures of menthol marketing near candy and the proportion of menthol marketing overall.(56) In 91 California school neighborhoods, using mixed models controlling for school neighborhood characteristics, school demographics, store type, and store density, the percent of enrolled black students was associated with lower mentholated Newport cigarette prices and greater volume of menthol marketing. Unadjusted results were not available. This result was not found for other racial/ethnic groups or for non-menthol products.(46) In Ramsey and Dakota County, Minnesota, the percentage of black residents in census block groups was associated with the total number of menthol ads at retailers.(65)

Less evidence was available regarding little cigars, cigarillos, and smokeless tobacco marketing. Two analyses of the same study of tobacco retailers in Washington, DC, show significant associations between little cigars and cigarillos and increasing proportion of black residents.(41, 49) In 50 California cities, adjusted models found no relationship between black race and the presence of little cigars, cigars, and cigarillos controlling for city marijuana use prevalence, city marijuana dispensary policy, city density of marijuana dispensaries, store type, store's block group population density, store's block group proportion of minors, store's block group proportion of whites and Hispanics, and store's block group socioeconomic status(55); however, unadjusted correlations from the author showed a significant relationship.[6]

Not all study results showed relationships between proportion of black residents and tobacco marketing. In Omaha, Nebraska, the logged amount of marketing per square mile was not associated with the percent of black residents, controlling for percent male, number of small stores, and outlet density;(60) however, the unadjusted correlation from the author was positive, $r_{(n=84)}=0.08$.[7] No relationship between the presence of marketing at New York City pharmacies and black race in averaged census blocks with centroids within 1/2 mile of the pharmacy was found.(39) The percentage of black residents in census block groups was negatively associated with total smokeless advertising in retailers in the Ramsey and Dakota County, Minnesota, area.(64) In three North Carolina counties, the likelihood of a violation of the U.S. Food & Drug Administration's tobacco advertising and labeling regulations was lower for neighborhoods with more black residents, controlling for store type and other neighborhood characteristics. Control for county caused this relationship to become non-significant.(32)

Evidence of Disparities by Asian-American Race in U.S.—Of the 33 studies from the U.S., six reported by neighborhood Asian composition.(45-47, 64-66) Of these, three scored high on our index of study characteristics.(46, 64, 65) These studies show limited evidence for targeted overall marketing and menthol disparities. These studies included no evidence suggesting disproportionate marketing for smokeless tobacco or little cigars.

[6]Personal e-mail communication from Sharon Lipperman-Kreda on June 16, 2014.
[7]Personal e-mail communication from Mohammad Siahpush on April 21, 2014.

The percentage of Asian-American residents in census block groups showed some positive associations across a wide variety of marketing outcomes among retailers in Ramsey and Dakota County, Minnesota, including count of menthol ads.(65) In the same study, the percentage of Asian-American residents in census block groups was negatively associated with total smokeless advertising in retailers.(64) In a study of 91 California school neighborhoods, Asian student enrollment was not associated with Newport price, menthol share of marketing, or Marlboro price after control for school and neighborhood characteristics; unadjusted results were not available.(46)

Evidence of Disparities by "Minority" Status in U.S.—Of the 33 studies from the U.S., 14 reported by "minority" status (operationalized as non-white, non-Hispanic or not defined).(38, 42, 45, 47, 48, 50, 51, 53, 55, 57, 59, 62, 64, 65) Of these, five scored high on our index of study characteristics.(48, 55, 62, 64, 65) The general pattern of results suggested greater overall marketing, more menthol marketing, and less smokeless tobacco marketing were associated with a greater proportion of "minority" residents. Of these, the evidence largely focused on overall marketing. In Oklahoma County, Oklahoma, neighborhoods in higher quartiles of percent "minority" population were more likely to have a greater amount of tobacco marketing.(48) In Ramsey and Dakota County, Minnesota, smokeless tobacco marketing was generally patterned to be more present in areas with more white residents and less present in areas with more non-white residents,(64) and there were more exterior ads and more menthol ads as the proportion of non-white residents increased.(65) In the Minneapolis-St. Paul metro area, discount and premium cigarettes were significantly more expensive in areas with more "minority" residents while menthol cigarettes were not more expensive in these neighborhoods.(62) In 50 California cities, the presence of small cigars, cigars, and cigarillos was negatively associated with the percentage of non-white residents after control for marijuana policies and characteristics at the city level and neighborhood demographics; unadjusted correlations from the author were marginally significant and positive.[8](55)

Evidence of Disparities by Hispanic/Latino Ethnicity in U.S.—Of the 33 studies from the US, 13 studies reported on Hispanic/Latino ethnicity.(32, 39, 44-46, 51, 53, 55, 57, 60, 64-66) Of these, seven scored high on our index of study characteristics.(32, 39, 46, 55, 60, 64, 65)

No relationship between marketing and Latino ethnicity was identified in New York City pharmacies;(39) California school neighborhoods (for menthol share, Marlboro price, and Newport price after control for neighborhood, school, and store characteristics);(46) Omaha, Nebraska, census tracts (for logged marketing materials per square mile after control for percent male, number of small stores, and outlet density);(60) Ramsey/Dakota County, Minnesota, census block groups (for smokeless and non-smokeless marketing);(64, 65) or, North Carolina census tracts (for FDA violations after control for store, tract characteristics, and county).(32) In a study of 50 California cities, Latino ethnicity was negatively

[8]Personal e-mail communication from Sharon Lipperman-Kreda on June 16, 2014.

associated with the presence of little cigars, cigars, and cigarillos in unadjusted correlations from the author.(55)[9]

Disproportionate Tobacco Marketing by Urbanicity—Seven records reported on urbanicity.(58, 61, 64, 65, 68, 76) Of these, four scored high on our index of study characteristics.(64, 65, 68, 76) The limited evidence was consistent with targeting smokeless tobacco marketing to more rural areas and menthol-specific marketing to more urban areas. In Ramsey and Dakota County, Minnesota, retailer location in suburban block groups was associated with fewer menthol ads but not with other types of marketing.(64, 65) Using a three-level measure of remoteness in New South Wales, Australia, retailers' remoteness was not associated with cigarette prices.(68) In the Wellington area of New Zealand, urbanicity was not related to retailer compliance with POS tobacco display bans.(76)

Influence of Neighborhood Composition of Retailer Types—Previous research shows the composition of retailers differs by neighborhood characteristics with more small, non-chain retailers in more urban areas.(79, 80) The differences identified can be partially, but in most cases not fully, explained by different composition of retailer types in neighborhoods. When studies controlled for store type, the identified disparities persisted. (39, 40, 46, 55, 56, 60, 62, 65, 67, 69, 73)

DISCUSSION

Principal findings

Across study locations and measures of tobacco marketing, there are differences in tobacco marketing at the POS by neighborhood demographics. The pattern of study results suggests that increasing proportions of low-income and black residents in neighborhoods are associated with more tobacco marketing generally, and more menthol marketing, specifically. We found that in the available evidence the proportion of Latino residents in neighborhoods was not typically associated with the amount of marketing in neighborhoods. Smokeless tobacco marketing appears to be targeted to more white, rural areas. Menthol marketing is starkly more present in more neighborhoods with more black residents and in urban neighborhoods. Evidence suggests little cigars may be more marketed at the POS in neighborhoods with more black residents than in other neighborhoods. Neighborhoods differ in the amount and type of tobacco marketing such that there are more inducements to start and continue smoking in lower-income and in neighborhoods with more black residents. Retailer marketing may be contributing to disparities in tobacco use. Clinicians should be aware that environmental cues to continue smoking are more pervasive in lower-income neighborhoods and neighborhoods with more black residents.

While the tobacco industry's use of market segmentation and targeting is likely a major factor, there may be important unmeasured neighborhood characteristics that are moderators of neighborhood tobacco marketing. These may include neighborhood characteristics that

[9]Personal e-mail communication from Sharon Lipperman-Kreda on June 16, 2014.

may be amenable to intervention,(81) such as ordinances limiting marketing in retailer windows or other licensing, zoning, or minimum price policies.(82, 83)

Researchers have not typically presented meta-analyzable results in this field, despite their importance to the broader field of tobacco control. Many otherwise compelling findings are not comparable due to the sampling and analytic strategies used. More sophisticated mixed modeling, while addressing important issues of dependence, produces results from which effect sizes cannot be calculated directly. This represents a challenge for this and future systematic syntheses of the evidence.

Understanding our results in the context of tobacco industry geodemographic targeting

Market segmentation and targeting are normative business practices.(84) Geodemographic targeting (*i.e.*, targeting by demographic profiles of people living within an area)(85) has become a routine business strategy as data sources and geospatial computing have become available.(86, 87) Indeed, tobacco industry documents show attention to developing algorithms to target in-store marketing by area demographics. Brown & Williamson documents express enthusiasm for the potential of marketing segmentation by retailer and noted segmentation's use for “Ensuring that product displays and signage are used in the right stores, feature the right products, and are seen by the right consumers.”(88) Philip Morris documents show customized presentations to convenience store chains based on an “Integrated Retail Demographic Database Micro-Marketing Tool” that incorporated store-area data on smokers, census demographics, periodical subscriptions, lifestyles, and retail pricing data.(89)

Philip Morris documents note how micro-marketing allowed the company to selectively implement “price promotion based on local market demographics”(90) and listed stores by neighbourhood profile from a commercial geodemographic classification system, PRIZM.(90) In a 1997 document, Philip Morris listed 50 neighbourhood demographic profiles and noted that profiles were predominantly influenced by age, ethnicity, education, income, marital status, urbanicity, family, employment, occupation, persons in household, and home ownership.(91) Figure 3 shows a slide from a Philip Morris USA presentation.(92) It is likely that these geodemographic targeting approaches have only become more sophisticated over time.

Strengths and weaknesses of this review

This is the first systematic review of neighbourhood tobacco marketing disparities to examine multiple demographic groups. One previous meta-analysis compared “black” versus “white” neighbourhoods.(24) It is likely that there are thresholds and non-linear relationships between demographic and marketing variables. Future studies should attempt to identify if there are particular levels of poverty or proportion of racial/ethnic populations that are most relevant.

The demographic characteristics of neighbourhoods are not independent of one another and are sometimes very highly correlated. This is particularly true for socioeconomic disadvantage and the proportion of black residents in many U.S. locations due to patterns of

segregation and racism. However, studies with multivariable and/or multi-level models suggest that these neighbourhood factors explain unique sources of variation in the prevalence of retail tobacco marketing.(46, 55, 56, 60, 62, 73)

Policy implications of the review

Recent work in tobacco prevention and control provided burgeoning evidence that many evidence-based interventions may exacerbate disparities while improving population health, (93-96) a concept termed the "inequality paradox."(97) In the search for pro-equity interventions beyond higher product prices,(94) regulation of the retail environment(98) has potential to have a pro-equity effect,(99) given the existing disparities identified in this review. So, too, do community efforts to reduce tobacco marketing at the POS.(100) But, this requires confirmation. There are multiple strategies for regulating tobacco marketing at the point of sale(98) and emerging strategies for ensuring minimum prices.(83)

Unanswered questions and future research

The origins of the identified disparities cannot be disentangled given the existing data. Two possible sources may be particularly likely. First, the tobacco industry uses geodemographic targeting to segment marketing. Second, social structures and processes may influence the types and numbers of tobacco retailers in neighborhoods. While the composition of retailer types may explain some of the disparities in tobacco marketing, the characteristics of the retail environment may also be driven, in part, by demand. Neighborhoods are complex, with the retail environment likely influenced by economic conditions, institutional/ regulatory environment, and community demography.(101) Thus, the complex interplay between demand and marketing may influence the types of retailers present, the products they carry, and their tobacco marketing.

Conclusion

Lower-income neighborhoods and neighborhoods with more black residents are disproportionately exposed to tobacco industry marketing. Menthol disparities are striking for neighborhoods with more black residents compared to all other demographic groups. Neighborhoods with a higher proportion of Latino residents showed no evidence of disproportionate marketing, and little evidence is available regarding tobacco marketing targeting neighborhoods with more Asian-American residents. While targeted marketing is a normative business practice,(84) its use for a unique class of consumer products that kill up to half(27) of their users represents an important issue of social injustice. Regulatory action, denormalization of these marketing practices, and community mobilization are warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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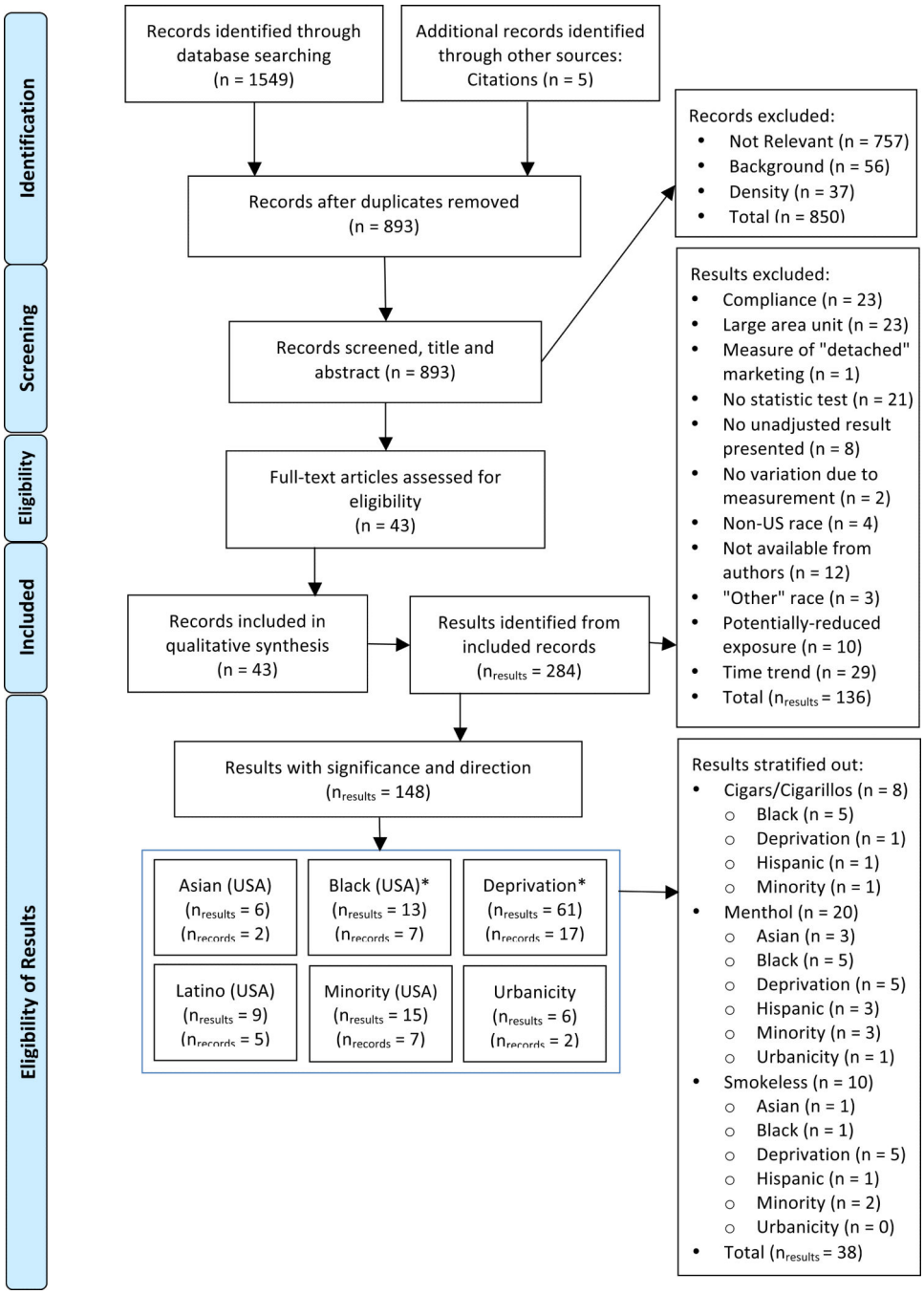

Figure 1.
PRISMA flow diagram of inclusion of studies and results, May 28, 2014

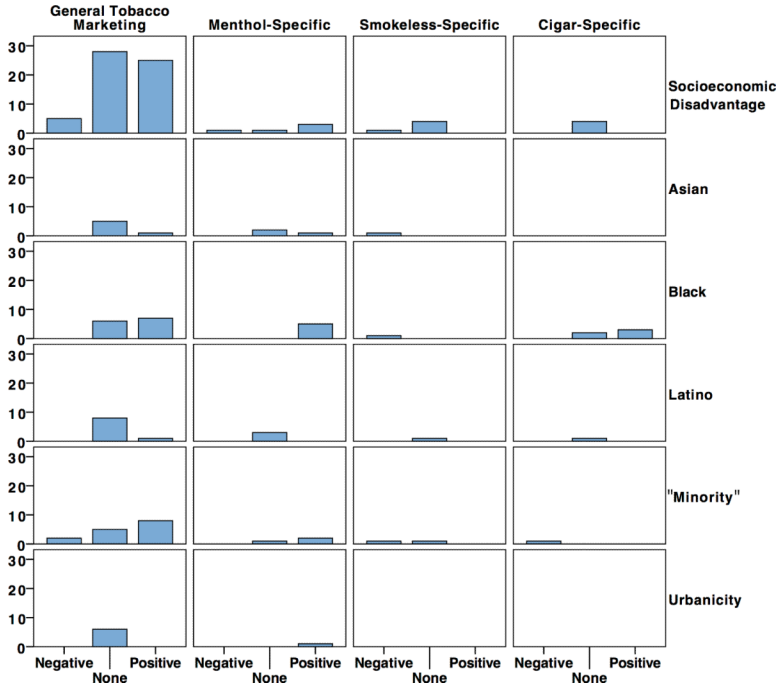

Figure 2.

Count of results by direction of association, type of marketing, and neighborhood characteristics, n=148, May 28, 2014

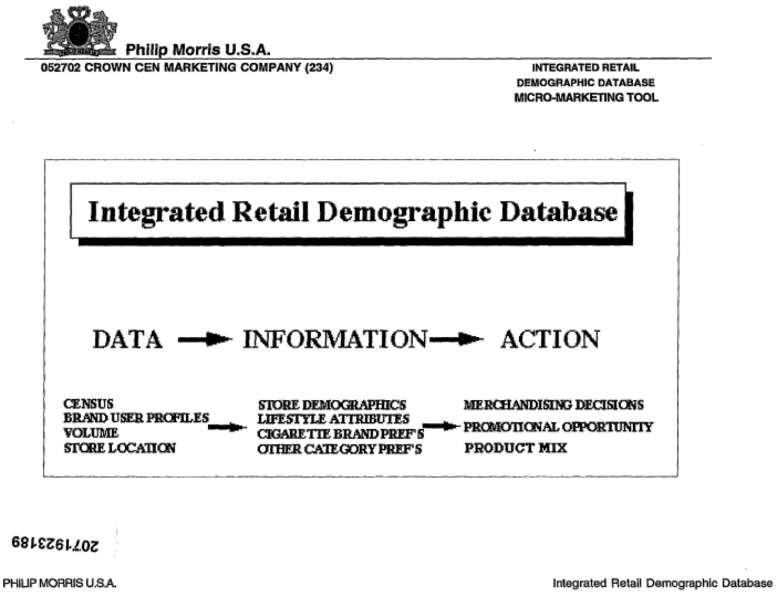

Figure 3.
Slide from Philip Morris USA Integrated Retail Demographic Database Presentation